REMARKS

In accordance with the foregoing, the specification and claims 1, 14, 15, 17, and 21-24 have been amended. No new matter is added. Claims 1, 3, 6-9, and 12-28 are pending and under consideration.

CLAIM REJECTIONS UNDER 35 U.S.C. §112

Claims 21-28 are rejected relative to the phrase "shorter than one kilometer" which does not correspond verbatim to the description in the specification of "hundreds of meters or less." Applicant makes a good faith effort to comply. In view of the amendments made to claims 21-24, Applicant respectfully requests the rejection to be withdrawn.

CLAIM REJECTIONS UNDER 35 U.S.C. §103

Claims 1, 3, 6, 8, 9 and 12-17 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over the article "All-optical fiber signal processing and regeneration for soliton communications" to Bigo et al. (hereinafter "Bigo"), "Optical Networks: A Practical Perspective" to Ramawaswami et al. ("Ramaswami"), U.S. Patent No. 5,548,433 to Smith et al. ("Smith") and U.S. Patent No. 5,596,667 to Watanabe ("Watanabe"). Claims 7 and 18 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Bigo, Ramaswami, Smith, and Watanabe in further view of "Simultaneous wavelength conversion and optical phase conjugation of 200 Gb/s (5x40 Gb/s) WDM signal using a highly nonlinear fiber four-wave mixer" by Watanabe et al. ("Watanabe 9/97"). Claims 19-28 18 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Bigo, Ramaswami, Smith, and Watanabe in further view of U.S. Patent No. 6,307,984 to Watanabe et al. (corresponding to WO98/08138, hereinafter "Watanabe WO").

Independent claim 1 is amended herewith to specify that the "amplitude modulated CW light having said wavelength λ_c [is] <u>different from an idler light</u> and [includes] a component of said frequency f_s by performing amplitude modulation of said continuous wave based on four-wave mixing <u>by two lights</u> between the signal light and the continuous wave generated by the laser oscillation using said signal light as pump light." The claim amendments are fully supported by the originally filed specification, for example, page 3 line 19 to page 5, line 2 and page 8 line 5 to page 10 line 19.

That is, the optical device recited in amended claim 1 generates an amplitude modulated CW light which is different from an idler light and has the same wavelength as the wavelength of the continuous wave generated by the laser oscillation based on four wave by mixing two lights

between the signal light and the continuous wave generated by the laser oscillation, but does not use the idler light.

In the prior art, the four-wave mixing is performed between a signal light (a probe light) and two pump lights, and a prior art method uses an idler light generated by this four wave mixing. In contrast according to amended claim 1, the four-wave mixing is performed by two lights between the continuous wave and a pump light. Accordingly the amplitude modulation by using four-wave mixing of amended claim 1 is different from the prior art method using four-wave mixing.

Bigo discloses that the nonlinear optical medium may be embodied by a variety of modulators (see e.g. p. 1215, col. 1, end of 1st paragraph), such as an amplitude/intensity modulator. However, Bigo fails to disclose generating an amplitude modulated continuous wave which is different from a phase conjugate light based on four-wave mixing by two lights between a signal light and the light continuous wave. The variety of modulators such as an amplitude intensity modulator or a phase modulator suggested in Bigo is different from the amplitude modulation by using the four wave mixing, "having said wavelength λ_c different from an idler light and including a component of said frequency f_s by performing amplitude modulation of said continuous wave based on four-wave mixing by two lights between the signal light and the continuous wave generated by the laser oscillation using said signal light as pump light" as recited in amended claim 1.

On page 141, 4th paragraph describing FIG. 3.43, Ramaswani discloses that "The most common means of achieving mode lock is by modulating the gain of a laser cavity. Either amplitude modulation or phase modulation can be used." However, Ramaswami fails to disclose generating an amplitude modulated continuous wave in the laser cavity. Further, Ramaswami fails to disclose generating an amplitude modulated continuous wave which is different from an idler light based on four-wave mixing by two lights between a signal light and the light continuous wave. The amplitude modulation of Ramaswani is different from the amplitude modulation based on four wave mixing of amended claim 1.

In col. 6 lines 52-58, Smith states "Irrespective of the particular components or configuration chosen, the method utilises the incoming data stream to drive or 'pump' a mode-locked laser, which in turn generates short, picosecond duration pulse trains at the base rate (or an exact multiple) of the data. The data serves to modulate either the amplitude or phase of the light in the laser cavity." However, Smith fails to disclose generating an amplitude modulated continuous wave in the laser cavity. Smith also fails to disclose generating an amplitude

modulated continuous wave which is different from an idler light based on four-wave mixing by two lights between a signal light and the light continuous wave. Accordingly, Smith fails to anticipate or render obvious the recitations of amended claim 1, since the amplitude modulation in Smith is different from the amplitude modulation based on four-wave mixing of the amended claim 1.

In col. 26, lines 24-41, Watanabe states:

> Here, if the case wherein no idler light is involved (E_I =0) is considered, then the following relations are obtained from the equations (13) to (16):
> $A_I(\omega_I, t) \alpha k| A_P(\omega_P,t)|2 A_S^*(\omega_S,t)$ (26)
> $\omega_I=2\omega_P-\omega_S$ (27)
> $\Phi_I(t)=2\Phi_P(t)- \Phi_S(t)$ (28)
> (1) Amplitude (Intensity) Modulation
> From the equation (26), it can be seen that, if the amplitude $A_P(\omega_P,t)$ of the pump light is varied, then the amplitude $A_I(\omega_I,t)$ of the output idler light (phase conjugate light) varies in proportion to the square of the absolute value of the amplitude $A_P(\omega_P,t)$. In particular, if amplitude (intensity) modulation is applied to the pump light as represented by the equations (29) and (30), then the output idler light is modulated by amplitude (intensity) modulation as given by the equation (31).

In Watanabe, no idler light is used (E_I =0) and the amplitude-modulated output idler light which is called a phase conjugate light is generated based on four-wave mixing between a signal light and a pump light. However, a wavelength of the output idler light is different from those of the signal light and the pump light. Therefore Watanabe also fails to anticipate or render obvious the "amplitude modulated CW light having said wavelength λ_c different from an idler light and including a component of said frequency f_s by performing amplitude modulation of said continuous wave based on four-wave mixing by two lights between the signal light and the continuous wave generated by the laser oscillation using said signal light as pump light" generated in the optical device of claim 1.

In view of the above, Applicant respectfully submits that amended independent claim 1 and claims 3, 6-9, 12, 18-21 and 25 depending directly or indirectly from claim 1, patentably distinguish over the cited prior art at least because the prior art does not anticipate that amplitude modulation recited in claim 1, that is:

"generating amplitude modulated CW light having said wavelength λ_c <u>different from an idler light</u> and including a component of said frequency f_s by performing amplitude modulation of

said continuous wave based on four-wave mixing by two lights between the signal light and the continuous wave generated by the laser oscillation using said signal light as pump light."

Independent claims 14, 15, and 17 are amended in a manner similar to amended claim 1. Amended independent claim 14 and claims 22 and 26 depending directly or indirectly from claim 14, patentably distinguish over the cited prior art at least because the prior art does not anticipate or render obvious the following recitation of claim 14:

"said nonlinear optical medium includes a second optical fiber to which said signal light of said input port is inputted from said optical loop, and said continuous wave having said wavelength λ_c is input from said optical loop, and generates amplitude modulated CW light having said wavelength λ_c different from an idler light and including a component of said frequency f_s by performing amplitude modulation of said continuous wave based on four-wave mixing by two lights between the signal light and the continuous wave generated by the laser oscillation using said signal light as pump light."

Amended independent claim 15 and claims 16, 23 and 27 depending directly or indirectly from claim 15, patentably distinguish over the cited prior art at least because the prior art does not anticipate or render obvious the following recitation of claim 15:

"wherein said nonlinear optical medium includes a second optical fiber to which said signal light of said input port is inputted from said optical loop, and said continuous wave having said wavelength λ_c is inputted from said optical loop, and generates amplitude modulated CW light having said wavelength λ_c different from an idler light and including a component of said frequency f_s by performing amplitude modulation of said continuous wave based on four-wave mixing by two lights between the signal light and the continuous wave generated by the laser oscillation using said signal light as pump light."

Amended independent claim 17 and claims 24 and 28 depending directly or indirectly from claim 17, patentably distinguish over the cited prior art at least because the prior art does not anticipate or render obvious the following recitation of claim 17:

"wherein said step (d) generates amplitude modulated CW light having said wavelength λ_c different from an idler light and including a component of said frequency f_s by performing amplitude modulation of said continuous was based on four wave mixing by two lights between the signal light and the continuous wave generated by the laser oscillation using said signal as pump light."

The other cited references, Watanabe 9/97 and Watanabe WO, do not correct or compensate for the above-identified failure of the cited references to anticipate or render obvious all the features recited in the independent claims.

CONCLUSION

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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By: _____

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